B4

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G06F 17/60

A2

(11) International Publication Number: WO 00/58896

(43) International Publication Date: 5 October 2000 (05.10.00)

(21) International Application Number: PCT/US00/08387

(22) International Filing Date: 31 March 2000 (31.03.00)

(30) Priority Data:
09/282,156 31 March 1999 (31.03.99) US

(71) Applicant: FREEMARKETS ONLINE, INC. [US/US]; One Oliver Plaza, 210 Sixth Avenue, Pittsburgh, PA 15222 (US).

(72) Inventors: KINNEY, Sam, E., Jr.; 314 Maple Lane, Sewickley, PA 15143 (US). RAGO, Vincent, F.; 15 Roxbury Road, Pittsburgh, PA 15221 (US). MEAKEM, Glen, T.; 703 Cochran Street, Sewickley, PA 15143 (US). STEVENS, Robert, G.; Apartment 1, 5518 Ellsworth Avenue, Pittsburgh, PA 15232 (US). BECKER, David, J.; 22 Sewickley Hills Drive, Sewickley, PA 15143 (US). BERNARD, Anthony, F.; 2518 Lindenwood Drive, Wexford, PA 15090 (US). RUPP, William, D.; 2151 Cayuga Drive, Pittsburgh, PA 15239 (US). HECKMANN, Daniel, C.; 4889 East Willock Road, Pittsburgh, PA 15227 (US).

(74) Agent: BOSWELL, Mary, Jane; Morgan, Lewis & Bockius LLP, 1800 M Street, NW, Washington, DC 20036 (US).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: METHOD AND SYSTEM FOR CONDUCTING ELECTRONIC AUCTIONS WITH NET PRESENT VALUE BIDDING

610 620 630 640 650 660

LI #	Part Num	Quantity /yr	Bid/ Unit	Year of Contract				NPV Bid
				1	2	3	4	
1	T1001	50,000	$10	$500,000	$475,000	$456,000	$442,320	$1,681,889
2	T1002	100,000	$3	$300,000	$285,000	$276,450	$276,450	$1,020,355
3	T1003	250,000	$1	$250,000	$227,500	$227,500	$227,500	$836,290
4	T1004	750	$600	$450,000	$432,000	$423,360	$423,360	$1,549,040
5	T1005	80,000	$8	$640,000	$640,000	$640,000	$640,000	$2,289,342
				651	652	653	Total NPV Bid	$7,376,916

654

(57) Abstract

A method and system for a business-to-business online auction is described. Bids by participating bidders are specified over multiple contract term segments (e.g., years), and define a pattern of cash payments over time. The auction system converts the defined pattern of cash payments over time into a net present value bid. The net present value bids are used to effect a common basis of comparison between participating bidders.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NR	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

METHOD AND SYSTEM FOR CONDUCTING ELECTRONIC AUCTIONS WITH NET PRESENT VALUE BIDDING

Background of the Invention

The disclosed invention relates generally to conducting online electronic auctions, and in particular to business-to-business bidding auctions for industrial purchasers.

Traditional Procurement Models

Procurement of supplies has traditionally involved high transaction costs, especially information search costs. The introduction of electronic commerce has introduced new methods of procurement that lower costs associated with procurement. Online procurement, or business-to-business electronic commerce, matches buyers and suppliers so that transactions can take place electronically. There are three models for online procurement: catalog, buyer-bidding auction, and supplier-bidding auction.

The "catalog" model of online procurement was the first to be developed. The first electronic catalogs were developed by suppliers to help customers obtain information about products and order supplies electronically. These first electronic catalogs were single-source; i.e. they only allowed customers to obtain information and products from that supplier.

However, customers are not typically satisfied with being "locked in" to one supplier - they wanted to be able to compare a number of competing products to be sure of getting the product features they wanted, at the best price. So suppliers with single-source electronic catalogs started to include competitors' products on their systems. An example of this is American's SABRE system, which includes offerings from competing suppliers (airlines), thereby further reducing information search costs. By offering competing products, the electronic catalog that offers competitor's products becomes an "electronic market".

Many of these systems are biased towards the supplier offering the electronic market. Procurement costs can be further lowered with an unbiased electronic market that promotes competition.

For standard products and services, the need to have an unbiased market has been met for many industries by third party "market makers." For example, Inventory Locator Services has compiled a database that lists all airplane parts suppliers that

have a certain item in stock. Buyers dial into the database to get information on the parts they need. Here, it is a third party, Inventory Locator Service, not a supplier, creating the unbiased electronic market.

The electronic catalog model of electronic commerce involves one buyer and one supplier at a time. When many buyers compete for the right to buy from one supplier, a buyer-bidding auction model is created. A noteworthy example of the buyer-bidding auction model is that operated by PriceLine.com and described in U.S. Pat. No. 5,794,207 issued to Walker et al. In this system, potential buyers compete for airline tickets by submitting a bid for an airline ticket on the PriceLine website, and airlines can choose to accept a bid, thereby committing the buyer to buy the ticket.

The catalog and buyer-bidding auction types of electronic markets do not work in some situations however. If the required product is custom made for the buyer, it is not possible for suppliers to publish a set price in advance for a catalog market. Likewise, it is not possible for buyers to specify all of the details of the product they want to purchase in a buyer-bidding auction. Traditionally, when a company requires a custom industrial product, procurement is made by a buyer for the company who searches for a potential supplier and acquires custom-tailored price quotes from a supplier for the needed custom product. The search is slow and somewhat random because it usually relies heavily on personal relationships. The costs associated with locating vendors, comparing their products, negotiating, and paperwork become big factors in a purchase decision. The cost of switching suppliers is very large, which means that the quoted price is probably not the lowest fair price and it is hard for a new supplier to enter the market.

As an alternative, buyers use auctions to save money. The assignee of the present application developed a system wherein suppliers downwardly bid against one another to achieve the lowest market price in a supplier-bidding auction.

In a supplier-bidding auction, bid prices typically start high and move downward in reverse-auction format as suppliers interact to establish a closing price. The auction marketplace is one-sided, i.e. one buyer and many potential suppliers. Typically, the products being purchased are components or materials. "Components" typically mean fabricated tangible pieces or parts that become part of assemblies of durable products. Example components include gears, bearings, appliance shelves, or door handles.

"Materials" typically mean bulk quantities of raw materials that are further transformed into product. Example materials include corn syrup or sheet steel.

Industrial buyers do not typically purchase one component at a time. Rather, they purchase whole families of similar components. At times, components are strongly related to one another. As an example, a buyer might purchase a given plastic knob in two different colors, or might purchase a nameplate in four different languages. These parts are so similar that by definition they must be purchased from the same supplier - all of the knobs are made using the same mold. These items are therefore grouped into a single lot. Suppliers in industrial auctions must provide unit price quotes for all line items in a lot.

Auction Process

The process for a supplier-bidding auction is described below with reference to Figs. 1 and 2. Fig. 1 illustrates the functional elements and entities in a supplier-bidding auction, while Fig. 2 is a process diagram that identifies the tasks performed by each of the involved entities.

The supplier-bidding auction model requires that the bidding product or service be defined by the buyer 10. An auction coordinator 20 works with buyers 10 to prepare for and conduct an auction and to define the potentially new supply relationships resulting from the auction.

As shown in Fig. 2, in the Initial Contact phase 102 of the auction process, the coordinator 20 contacts the buyer 10, and the buyer 10 provides data to the coordinator 20. The coordinator 20 prepares a specification 50 for each desired product or part 52. Once the product 52 is defined, potential suppliers 30 for the product are identified. The coordinator 20 and buyer 10 work together to compile this list of potential suppliers from suppliers already known to the buyer 10 as well as suppliers recommended by the coordinator 20.

The buyer 10 makes a decision regarding which potential suppliers 30 will receive invitations to the upcoming Auction. Suppliers 30 that accept Auction invitations are then sent notices regarding the upcoming Auction, as well as client software to install in preparation of participating in the Auction.

In the RFQ phase 104, the coordinator 20 works with the buyer 10 to prepare a Request for Quotation ("RFQ") 54. The coordinator 20 collects and maintains the RFQ

data provided by buyer 10, and then publishes the RFQ 54, and manages the published RFQ 54. The RFQ 54 includes specifications 50 for all of the parts 52 covered by the RFQ 54. In the RFQ 54, buyer 10 aggregates similar part or commodity line items into job "lots." These lots allow suppliers 30 to bid on that portion of the business for which they are best suited.

During the auction 56, bids 58 will be taken against individual lots (and their constituent parts 52) within RFQ 54. While suppliers 30 must submit actual unit prices for all line items, the competition in an Auction is based on the aggregate value bid for lots. The aggregate value bid for a lot depends upon the level and mix of line item bids and the quantity for each line item. Therefore, suppliers 30 submit bids at the line item level, but compete on the lot level.

In the Auction Administration phase 106, coordinator 20 coordinates the Auction and administers the Auction setup and preparation. The coordinator 20 sends a RFQ 54 to each participating supplier 30, and assists participating suppliers 30 with preparation for the Auction.

In the Auction phase 108, suppliers 30 submit bids 58 on the lots and monitor the progress of the bidding by the participating suppliers 30. The coordinator 20 assists, observes, and administers the Auction.

When the bidding period is over, the auction enters the Auction Results Administration phase 110. In this phase, coordinator 20 analyzes and administers the Auction results, which are viewed by buyer 10. The buyer 10 begins to conduct final qualification of the low bidding supplier(s). The buyer 10 retains the right not to award business to a low bidding supplier 30 based on final qualification results or other business concerns.

In the ensuing Contract Administration phase 112, the coordinator 20 facilitates settlements 60 awarded by the buyer 10 to suppliers 30. Contracts 52 are then drawn up between buyer 10 and suppliers 30.

Communications and Software

The Auction is conducted electronically between potential suppliers 30 at their respective remote sites and the coordinator 20 at its site. As shown in Figs. 3 and 4, information is conveyed between the coordinator 20 and the suppliers 30 via a communications medium such as a network service provider 40 accessed by the

participants through, for example, dial-up telephone connections using modems, or direct network connections. A computer software application is used to manage the Auction. The software application has two components: a client component 31 and a server component 23. The client component 31 operates on a computer at the site of each of the potential suppliers 30. The client component is used by suppliers 30 to make bids during the Auction. The bids are sent via the network service provider 40 to the site of the coordinator, where it is received by the server component 23 of the software application. The client component 31 includes software used to make a connection through telephone lines or the Internet to the server component 23. Bids 58 are submitted over this connection and updates are sent to connected suppliers.

Bids 58 can only be submitted using the client component 31 of the application – this ensures that buyers do not circumvent the bidding process, and that only invited suppliers participate in the bidding. Typically, bidders can see their bids and bids placed by other suppliers for each lot on the client component 31. When a bidder submits a bid, that bid is sent to the server component 23 and evaluated to determine whether the bid is from an authorized bidder, and whether the bid has exceeded a pre-determined maximum acceptable price. Bids placed by a supplier are broadcast to all connected bidders thereby enabling every participating bidder to see quickly the change in market conditions and begin planning their competitive responses.

Summary of the Invention

Traditional auction systems foster competition for products/services based upon the comparison of single-parameter bids. These single-parameter bids reflect a static valuation of the product/service on which the competition is based. A simple mathematical comparison between received single-parameter bids is sufficient to determine the relative value of competing bids.

The present invention fosters competition in a unique way by allowing bidding suppliers to incorporate into the bidding process considerations of the transient nature of their manufacturing/supply capabilities, cash/credit constraints, etc. These considerations impact their anticipated performance over multiple years of a supply contract.

Performance over multiple years is also a significant concern to the buyer because of the buyer's anticipated cost of capital. This buyer-determined time value of

money becomes a significant factor in evaluating the relative competitiveness of multi-year contract bids.

Accordingly, the present invention increases the competitive dimensions upon which the auction process is run by incorporating the time value of money into the bidding process. In this process, the buyer first identifies a lot of products sought to be purchased. The lot of products includes individual line items, one or more of which are sought to be purchased over multiple contract years.

Based upon the lot specification, participating suppliers generate multi-year contract bids. The multi-year contract bids are then converted into a total net present value (NPV) bid. Participating suppliers transmit NPV bid information for the lot of products to the auction server. The bid information for each year is used to determine a total NPV bid. The total NPV bid represents a sum of a series of payments over multiple contract years, which are discounted to a present value using a predefined discount rate or rates.

NPV bid information received from all of the participating suppliers is fed back to each of the participating suppliers. The receipt of the NPV bid information enables each of the participating suppliers to view a relative comparison of all multi-year bids generated by all of the participating suppliers.

Because the time value of money is considered, a bidder offering steeper discounts in the early years of a multiple year contract will look relatively more attractive than a bidder whose discounts are offered in later years. The NPV methodology reduces all of the possible options over multiple years to one number for comparison purposes.

Brief Description of the Drawings

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention that together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 illustrates the elements and entities involved in an auction process.

Fig. 2 illustrates the tasks performed by the entities involved in an auction process.

Fig. 3 illustrates the communications links between the coordinator and the potential suppliers in an auction.

Fig. 4 illustrates the client and server components of the computer software application that conducts the auction and the hardware at the sites of the coordinator and the potential suppliers on which the client and server components operate.

Fig. 5 illustrates an example of a user interface that can be used to define a multi-year bid using annual percentage discounts below the base year bid.

Fig. 6 illustrates the calculation of a total net present value bid using the base year bid, the quantity, and the annual-percentage discounts.

Fig. 7 illustrates a net present value bid history graph.

Fig. 8 illustrates a net present value bid history table.

Detailed Description

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

On-line auctions have provided tremendous savings through the reduction in costs associated with procurement. In particular, individual negotiations between a buyer and multiple suppliers have been combined into a single concurrent on-line forum.

In this concurrent on-line forum, the buyer specifies the components or materials that are desired to be purchased. As industrial buyers do not typically purchase one component at a time a number of items are grouped together into a single lot. Although suppliers must submit actual unit prices for all line items in a lot, the competition between the suppliers is based on the aggregate value bid for lots. The aggregate value bid for a lot depends upon the level and mix of line item bids and the quantity for each line item.

During the auction phase, suppliers submit bids on a lot and monitor the progress of the bidding by the participating suppliers. Suppliers participating in the auction can modify their outstanding aggregate value bids or can adjust the unit bid values of one or more of the line items in the lot. In effect, the supplier must determine the adequacy and appropriateness of selling a particular item (i.e., component or material) in the lot at the adjusted unit bid price.

The profit in the sale of a particular line item can be sacrificed to secure the contract for the entire lot. In that regard, the supplier can potentially view the adequacy of the unit bid price apart from particular details of his manufacturing capabilities and/or supply chain of the individual line items. More generally, however, the supplier must always be keenly aware of the limits to which the individual unit bid prices can be adjusted downward. This awareness is often clouded in the "heat" of the auction process when the possibility of losing the contract overwhelms the supplier. For that reason, individual line item limits can be established to prevent the supplier from inadvertently lowering the price beyond a predefined level. These flexible supplier-determined line item decision rules are described in greater detail in co-pending Application No. _____, entitled "Method and System for Conducting Electronic Auctions," filed February 19, 1999, the disclosure of which is hereby expressly incorporated in the present application.

As described, a supplier's internal evaluation of the adequacy of its bid is based upon the manufacturing/supply capabilities existing at that point in time. Accordingly, each of the suppliers' bids define a static view of a lot of products. The perception of the lot of products as an unchanging item is similar to other on-line auction systems that entertain bids for collectible items (e.g., autographed baseball). These collectible items are fixed and can be defined based upon a single bid reflective of the supplier's perception of the item's valuation.

The present invention represents a significant shift away from a static view of an auction item. More particularly, auction items can have valuations that are affected by numerous factors that are entirely unrelated to the intrinsic value/cost of an auction item. These factors can be based upon the idiosyncratic qualities of both the buyer and the potential suppliers.

In the supplier's case, there are many considerations beyond the current manufacturing/supply capabilities that may be relevant in determining an adequate contract price for the lot. For example, each supplier may have different assessments of the transient nature of their own manufacturing/supply capabilities based upon the relative learning curve, economies of scale, etc. Moreover, each of the suppliers may have a different view of the value of relative cash/credit constraints over a period of years.

The present invention further recognizes that there are similar considerations on the buyer's side. A buyer's purchasing behavior is heavily dependent upon the anticipated cost of capital. The anticipated cost of capital is highly dependent upon the business climate that the buyer projects into the future. Accordingly, the buyer-determined time value of money becomes a significant factor in evaluating the propriety of any anticipated financial outlay.

These time factors are particularly relevant in defining the relative valuation for a supply contract that spans multiple years. If these time factors are not included as part of the valuation process, the single buyer and the multiple suppliers are effectively negotiating solely over the price of the first year of the contract. Suppliers are therefore prevented from fully impounding in their bids their own idiosyncratic valuations of their anticipated performance in future years of the contract.

The present invention increases the competitive dimensions upon which the auction process is run. In particular, the auction process of the present invention allows suppliers to exploit their competitiveness over all years of a supply contract through the consideration of the time value of money. More generally, the auction process of the present invention allows suppliers to compete on arbitrarily defined contract term segments (e.g., quarters, years, etc.) simultaneously. By incorporating the time value of money into the bidding process, the present invention allows the suppliers to compete on all years of a supply contract simultaneously. This feature is in sharp contrast to individual negotiations over the pricing of each of the individual years of the contract.

In a conventional auction system, suppliers submit single parameter bids (i.e., offered product price) to the auction server. The single parameter bid reflects a static valuation of a product. In the present invention, an overall contract valuation is based on multiple parameters reflective of multiple years of a contract. These multiple parameters are used as inputs into a bidding process that factors in the time value of money. General transformation of multiple parameters into an overall contract valuation is described in greater detail in co-pending Application No. _____, entitled "Method and System for Conducting Electronic Auctions with Multi-Parameter Price Equalization Bidding," filed concurrently herewith, the disclosure of which is hereby expressly incorporated in the present application.

The time value of money can be expressed using the concept of net present value (NPV). NPV determines the present value of future streams of cash payments and can be expressed by equation (1) as follows:

$$NPV = \sum_i \frac{x_i}{(1+r)^i} = \frac{x_1}{1+r} + \frac{x_2}{(1+r)^2} + \frac{x_3}{(1+r)^3} + \ldots \quad (1)$$

In this equation, x_i represents the payments in the i^{th} year, and r represents the implied interest rate or discount rate. The payment information x_i is provided by the suppliers, while the discount rate r is typically provided by the buyer. Note that r need not be the same for each year, and hence may represent a vector of values r.

In the present invention, each of the multi-parameter bids that are provided by one or more suppliers is converted into a NPV bid. The calculated NPV bids enable the buyer to compare multi-year bids on an equivalent "apples-to-apples" basis. Moreover, the calculated NPV bid information is transmitted to the suppliers so that the suppliers can determine their relative competitiveness with the market.

Generally, NPV bidding enables the creation of flexible auctions in which suppliers can submit bids involving different cash flows over time. For example, consider the following possible scenarios:

(1) Suppliers may wish to submit price quotes for a multi-year contract with a different pattern of discounts offered in subsequent years. Supplier 1 may offer a $100,000 price quote in year 1, with a 10% reduction in year 2 and a further 10% reduction in year 3. Supplier 2, on the other hand, may offer a $95,000 price quote in year 1, with a 3% reduction in year 2 and a 3% reduction in year 3.

(2) Suppliers may wish to submit price quotes for contracts of different lengths. Supplier 1 may offer a quote of $95,000 fixed for two years. Supplier 2 may offer a quote of $100,000 in year 1 and $50,000 in years 2 and 3.

(3) Suppliers may wish to submit investment proposals comparing options with different payment timing or comparing make or buy options. Supplier 1 submits a proposal to sell a fixed asset for $100,000 in year 1, with

annual maintenance payments of $5,000 in years 2 through 10 (assume a 10 year asset life). Supplier 2 submits a proposal to lease the same asset for an annual payment of $25,000 years 1 through 10.

In these examples, each proposal can be reduced to a pattern of cash payments over time. The attractiveness of each proposal will then depend on the buyer's evaluation of the time value of money.

The auction system of the present invention supports real-time NPV bidding. Competition on the NPV level is provided through the initial specification and subsequent modification of multi-year bidding parameters.

One example of a user interface that accommodates multi-year NPV bidding is illustrated schematically in Fig. 5. The user interface of Fig. 5 includes the elements that define a bid for a particular lot of products. As noted above, bidding typically occurs on the lot level, with the suppliers specifying the pricing of individual line items. Individual line items are defined by columns 510, 520, 530, and 540, which specify the line item number, the part number, the quantity of the item per year, and the bid price per unit, respectively. With the exception of the bid price per unit, each of these parameters is typically defined by the buyer as part of the original RFQ.

In the example user interface of Fig. 5, each of the line items in the lot of products is specified in column 550 as having a term length of 4 years. It should be noted that variable length terms for the individual line items could also be defined. Generally, the term lengths for the individual line items can be defined by either the buyer or the supplier in combination with the quantity and price variables for the individual line items.

Column 560 defines the relevant reduction rates for each of the years in the terms of the individual line items. The reduction rates for each of the individual years are listed in sub-columns 561-563 where appropriate. Consider line item number 1. Line item number 1 defines a four-year term for the supply of 50,000 units per year at a price of $10/unit. The cost of the first year of the supply contract is therefore $500,000. Sub-columns 561, 562, and 563 specify the supplier-defined reduction rates for the second and third years of the supply contract, respectively. The reduction rates of 5%, 4%, and 3% are used to calculate the cost of the second, third, and fourth years of the contract relative to the previous year of the contract. Thus, the 5% discount for the

second year of the contract yields a cost of $475,000, the further 4% discount for the third year of the contract yields a cost of $456,000, and the further 3% discount for the fourth year of the contract yields a cost of $442,320.

The example user interface of Fig. 5 can be used by a supplier to interactively define a pattern of cash payments over time. During the bidding process, the supplier can modify one or more of his outstanding bids (or create new bids), by modifying the values of one or more of the input fields in columns 540, 550, and 560. More specifically, the supplier can choose to modify the bid per unit value, the number of years in the supply contract, or the reduction rates for subsequent years of the contract.

It should be noted that the user interface of Fig. 5 represents only one method of defining a pattern of cash payments over time. Other input mechanisms can be used. For example, instead of supporting the input of reduction rates for subsequent years of the contract, the user interface can be designed to accept actual cash price quotations for each year in the specified contract term. This mechanism would be particularly useful where the contract contemplated a highly variable or disparate sequence of cash payments (e.g., large up front cost with smaller maintenance payments in subsequent years).

The input fields illustrated in the user interface of Fig. 5 represent one example of multi-year bidding parameters. As noted above, various other user interfaces could be defined. Generally, the multi-year bidding parameters represent any collection of values that can be used to define a pattern of cash payments over time. It should be further noted that the time interval of the contract term segments need not represent one-year increments. Quotes could be evaluated and discounts offered for fiscal quarters, for example. This might be a reasonable requirement for seasonal items. For simplicity and not by way of limitation, the present invention is described using one-year contract term segments.

The definition of a pattern of cash payments over time enables a supplier to capitalize on their idiosyncratic views of their current and prospective manufacturing and supply capabilities. These idiosyncratic views reflect a dynamic valuation of the individual years of the contract. While conventional auction systems focus on a single static view of a product or year of production, the present invention focuses on multi-year cash payment patterns that are unique to the particular suppliers.

Supplier-specific multi-year cash flow patterns cannot be readily compared with each other. Relative valuations between the supplier-defined multi-year cash flow patterns are enabled through a buyer's relative valuation of the time value of money. As noted, this valuation can be based upon the buyer's projected cost of capital.

In the present invention, the supplier-defined multi-year cash flow pattern is translated to a net present value based upon a buyer-defined discount rate. This buyer-defined discount rate is typically provided to the auction server for use during the auction process.

The use of the buyer-defined discount rate is reflected in the calculations illustrated in Fig. 6. These calculations are based upon the multi-year bidding parameters that were defined in the example user interface of Fig. 5. Columns 610, 620, 630, and 640 of the table of Fig. 6 include the information of columns 510, 520, 530, and 540 of the user interface of Fig. 5. These columns contain the basic bid information (i.e., quantity and price) of the individual line items.

Column 650 of the table of Fig. 6 includes the multi-year cash flow pattern data. The multi-year cash flow pattern data is generated using the basic bid information and the relevant supplier-defined reduction rates of column 560 of the user interface of Fig. 5. The first year of the contract for the particular line item is calculated simply by multiplying the quantity per year value of column 630 with the bid price per unit value of column 640. For example, the payment for the first year of the contract for line item #1 would be 50,000 units X $10/unit = $500,000. It should be noted that the quantity of product required by the buyer need not be the same for all years. The present invention should be interpreted to include the general case where columns 530/630 represent a vector of quantities, one corresponding to each time period under consideration.

The payments for any subsequent years of the contract are determined by reducing the payment of the previous year by the reduction rate. For example, the payment for the second year of the contract for line item #1 would be $500,000 X (1 - 0.05) = $475,000, the payment for the third year of the contract for line item #1 would be $475,000 X (1 - 0.04) = $456,000, and the payment for the third year of the contract for line item #1 would be $456,000 X (1 - 0.03) = $442,320. These payment values for the four years of the contract for line item #1 are reflected in columns 651-654 of the table of Fig. 6. As noted above, the calculations of the payments for the

individual contract years would be unnecessary if the supplier had defined the cash flow patterns for the multi-year contract directly.

After the multi-year cash flow pattern data is generated in columns 651-654, it is converted into a NPV bid. This conversion requires a discount rate to be defined. In one embodiment, the discount rate is defined by the buyer. In an alternative embodiment, the discount rate is defined by the auction server. In the example calculations of the Table of Fig. 6, an 8% discount rate is assumed. The discount rate can be set separately for each year. The discount rate can also be set separately for each lot.

The NPV calculation is performed for all line items. Thus, in the example of Figs. 5 and 6, a NPV calculation is performed for line item # 1-5. When a bidder has elected not to supply a reduction rate in a later contract year, the NPV calculation assumes that the earlier year quote continues with no further rate of reduction. As an example, consider line item #1, the NPV is calculated in accordance with equation (1) as follows:

$$NPV = \$500{,}000 + \frac{\$475{,}000}{1+0.08} + \frac{\$456{,}000}{(1+0.08)^2} + \frac{\$442{,}320}{(1+0.08)^3} = \$1{,}681{,}889 \qquad (2)$$

Similar NPV calculations are performed for each of the line items, the results being reflected in column 660. The summation of the individual line item NPV values in column 660 yields a total NPV bid for the lot of products. This total NPV bid is the basis upon which the auction process is run.

The NPV calculations illustrated in the table of Fig. 6 are performed by software running on both the client component and the auction server component. For example, the computations on the client component of the supplier's computer can be used by the supplier in the iterative determination of a proper bid. Once a bid has been settled upon, the client component transmits the multi-year bidding parameters to the auction server component. As noted above, the multi-year bidding parameters represent those pieces of information that can be used to define a pattern of cash payments over time. In contrast to conventional auction systems that operate on single parameter bid values, the database structure of the auction server in the present invention supports the storage and manipulation of multi-year bidding parameters. In an alternative implementation, the client component could calculate all NPV values and submit to the

auction server component only the final calculated NPV bid for comparison at the server.

Upon receipt of the multi-year bidding parameters from the supplier, the auction server calculates the total NPV bid using the multi-year bidding parameters and the discount rate. The total NPV bid is used to effect a relevant comparison between the bids of the participating suppliers. The total NPV bid is then fed back to the suppliers so that they can determine their relative position within the auction for that lot of products. Note that it is not important whether bidders are aware of the exact discount rate(s) *r* used to calculate NPV.

Figs. 7 and 8 illustrate the use of the total NPV bid information at the supplier computer. The NPV bid history graph of Fig. 7 is a graphical illustration of the value and timing of the NPV bids that have been received by the participating suppliers. The NPV bid history table of Fig. 8 is a listing of the NPV bids in descending numerical order. Each client component on a supplier's computer can generate a NPV bid history graph and a NPV bid history table based upon the NPV bid information that is received from the auction server.

The total NPV bid of $7,376,916, which was calculated in Figs. 5 and 6, represents the bid by Supp City Corp. that was submitted at 1:31 PM. This bid is reflected by point 701 in the NPV bid history graph of Fig. 7. As further reflected by the NPV bid history table of Fig. 8, the NPV bid is the first bid submitted by Supp City Corp. and represents the lowest of the first four initial bids received between the times of 1:31 PM and 1:36 PM. After this initial flurry of bids, each of the individual suppliers have the opportunity to reevaluate their outstanding bids and make whatever modifications necessary to maximize their chances of securing the contract for the lot of products. During this reexamination period, each of the suppliers can modify any of the parameters illustrated in the example user interface of Fig. 5. These changes will lead to a subsequent change to the total NPV bid. If the supplier elects to modify its bid, the new bidding parameters are submitted to the auction server. The auction server recalculates the new total NPV bid and feeds that information back to the participating suppliers. In this manner, the auction system of the present invention incorporates the net present value calculations in real-time to permit the buyer and participating suppliers to capitalize on their idiosyncratic valuations of capital, time value of money, manufacturing, or supply over a period of time.

Significant elements of strategy can be invoked using NPV style bidding. For example, a particular supplier can tailor the multi-year bid to maximize their profitability in the early years of the contract, while sacrificing profitability in later years of the contract. In this scenario, the supplier would offer a larger first year bid that is severely reduced in subsequent years. Many other bidding strategies are possible. These strategies focus on multi-year considerations as opposed to a single static view of an item to be supplied. Alternatively, a bidder may elect to bid at or below cost in the early years but drop prices more slowly than anticipated cost declines.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof. In particular, it should be noted that while the auction functions described above have been described in the context of downward pricing auctions the auction functions can be equally applied to upward pricing auctions. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

WHAT IS CLAIMED IS:

1. A method of conducting an electronic online auction between a plurality of bidders, the plurality of bidders competing for a lot having at least one product, comprising the steps of:

(a) receiving net present value bid information from a bidder for the lot;

(b) generating a net present value bid value using said net present value bid information, said net present value bid value representing a sum of a series of payments over a plurality of contract term segments which are discounted to a present value using a predefined discount rate structure; and

(c) transmitting net present value bid information to a plurality of bidders, said net present value bid information enabling a plurality of bidders to view a relative comparison of net present value bids submitted by a plurality of bidders.

2. The method of claim 1, further comprising the step of receiving a predefined discount rate structure from a buyer.

3. The method of claim 1, wherein step (a) comprises the step of receiving multi-segment bidding parameters, said multi-segment bidding parameters defining a pattern of payments over a plurality of contract term segments.

4. The method of claim 3, wherein step (a) comprises the step of receiving a unit bid, a contract length, a contract quantity or quantities, and price reduction values for a plurality of contract term segments.

5. The method of claim 3, wherein step (a) comprises the step of receiving price values for each of the plurality of contract term segments.

6. The method of claim 1, wherein step (c) comprises the step of transmitting a net present value bid value to a plurality of bidders.

7. A system for conducting an electronic online auction between a plurality of bidders, the plurality of bidders competing for a lot having at least one product, comprising:

means for receiving net present value bid information from a bidder for the lot;

means for generating a net present value bid value using said net present value bid information, said net present value bid value representing a sum of a series of payments over a plurality of contract term segments which are discounted to a present value using a predefined discount rate structure; and

means for transmitting net present value bid information to a plurality of bidders, said net present value bid information enabling a plurality of bidders to view a relative comparison of net present value bids submitted by a plurality of bidders.

8. The system of claim 7, wherein said received net present value bid information includes multi-segment bidding parameters defining a pattern of payments over a plurality of contract term segments.

9. The system of claim 8, wherein said received net present value bid information includes a unit bid, a contract length, a contract quantity or quantities, and price reduction values for a plurality of contract term segments.

10. The system of claim 8, wherein said received net present value bid information includes price values for each of the plurality of contract term segments.

11. The method of claim 7, wherein said transmitted net present value bid information is a net present value bid value.

12. A method for participating in an electronic online auction between a plurality of bidders, the plurality of bidders competing for a lot having at least one product, comprising the steps of:

(a) generating a net present value bid based upon a specification of a pattern of payments over a plurality of contract term segments, said pattern of payments over a plurality of contract term segments being discounted to a present value using a predefined discount rate structure;

(b) transmitting net present value bid information to an auction server;

(c) receiving net present value bid information representative of the net present value bids of other bidders;

(d) displaying a relative comparison of net present value bids submitted to the auction server; and

(e) generating a modified net present value bid based on a change of said specification of said pattern of payments over a plurality of contract term segments.

13. The method of claim 12, wherein step (a) comprises the step of generating a net present value bid based upon a specification of a unit bid, a contract length, a contract quantity or quantities, and price reduction values for the plurality of contract term segments.

14. The method of claim 12, wherein step (a) comprises the step of generating a net present value bid based upon a specification of price values for each of the plurality of contract term segments.

15. The method of claim 12, wherein step (b) comprises the step of transmitting a net present value bid value.

16. The method of claim 15, further comprising the step of calculating said net present value bid value using said specification of a pattern of payments over a plurality of contract term segments.

17. The method of claim 12, wherein step (c) comprises the step of receiving net present value bid values of other bidders.

18. The method of claim 12, wherein step (c) comprises the step of receiving net present value bidding parameters of other bidders.

19. The method of claim 18, further comprising the step of calculating a net present value bid value using said net present value bidding parameters of other bidders.

20. The method of claim 19, wherein said step of calculating comprises the step of calculating a net present value bid value using a specification of a unit bid, a contract length, a contract quantity or quantities, and price reduction values for the plurality of contract term segments.

21. The method of claim 19, wherein said step of calculating comprises the step of calculating a net present value bid value using a specification of price values for each of the plurality of contract term segments.

22. A computer program product for enabling a processor in a computer system to process bidding information in an auction between a plurality of bidders, said computer program product comprising:

a computer usable medium having computer readable program code means embodied in said medium for causing an application program to execute on the computer system, said computer readable program code means comprising

a first computer readable program code means for enabling the computer system to generate a net present value bid based upon a specification of a pattern of payments over a plurality of contract term segments, said pattern of payments over a plurality of contract term segments being discounted to a present value using a predefined discount rate structure;

a second computer readable program code means for enabling the computer system to transmit net present value bid information to an auction server;

a third computer readable program code means for enabling the computer system to receive net present value bid information representative of the net present value bids of other bidders;

a fourth computer readable program code means for enabling the computer system to display a relative comparison of net present value bids submitted to the auction server; and

a fifth computer readable program code means for enabling the computer system to generate a modified net present value bid based on a change of said specification of said pattern of payments over a plurality of contract term segments.

23. The computer program product of claim 22, wherein said first computer readable program code means comprises computer readable program code means for enabling the computer system to generate a net present value bid based upon a specification of a unit bid, a contract length, a contract quantity or quantities, and price reduction values for the plurality of contract term segments.

24. The computer program product of claim 22, wherein said first computer readable program code means comprises computer readable program code means for enabling the computer system to generate a net present value bid based upon a specification of price values for each of the plurality of contract term segments.

25. The computer program product of claim 22, wherein said second computer readable program code means comprises computer readable program code means for enabling the computer system to transmit a net present value bid value.

26. The computer program product of claim 25, further comprising computer readable program code means for enabling the computer system to calculate said net present value bid value using said specification of a pattern of payments over a plurality of contract term segments.

27. The computer program product of claim 22, wherein said third computer readable program code means comprises computer readable program code means for enabling the computer system to receive net present value bid values of other bidders.

28. The computer program product of claim 22, wherein said third computer readable program code means comprises computer readable program code means for enabling the computer system to receive net present value bidding parameters of other bidders.

29. The computer program product of claim 28, further comprising sixth computer readable program code means for enabling the computer system to calculate a net present value bid value using said net present value bidding parameters of other bidders.

30. The computer program product of claim 29, wherein said sixth computer readable program code means comprises computer readable program code means for enabling the computer system to calculate a net present value bid value using a specification of a unit bid, a contract length, a contract quantity or quantities, and price reduction values for the plurality of contract term segments.

31. The computer program product of claim 29, wherein said sixth computer readable program code means comprises computer readable program code means for enabling the computer system to calculate a net present value bid value using a specification of price values for each of the plurality of contract term segments.

32. A method of conducting an electronic online auction between a plurality of bidders, the plurality of bidders competing for a lot having at least one product, comprising the steps of:

(a) generating, by a first bidder, a net present value bid based upon a specification of a pattern of payments over a plurality of contract term segments, said pattern of payments over a plurality of contract term segments being discounted to a present value using a predefined discount rate structure;

(b) transmitting, by said first bidder, first net present value bid information to an auction server;

(c) generating, by said auction server, a net present value bid value using said first net present value bid information, said net present value bid value representing a sum of a series of payments over a plurality of contract term segments which are discounted to a present value using a predefined discount rate structure;

(d) displaying, by said auction server, a relative comparison of submitted net present value bid values; and

(e) transmitting, by said auction server, second net present value bid information to at least a second bidder, said second net present value bid information enabling said second bidder to view a relative comparison of submitted net present value bid values.

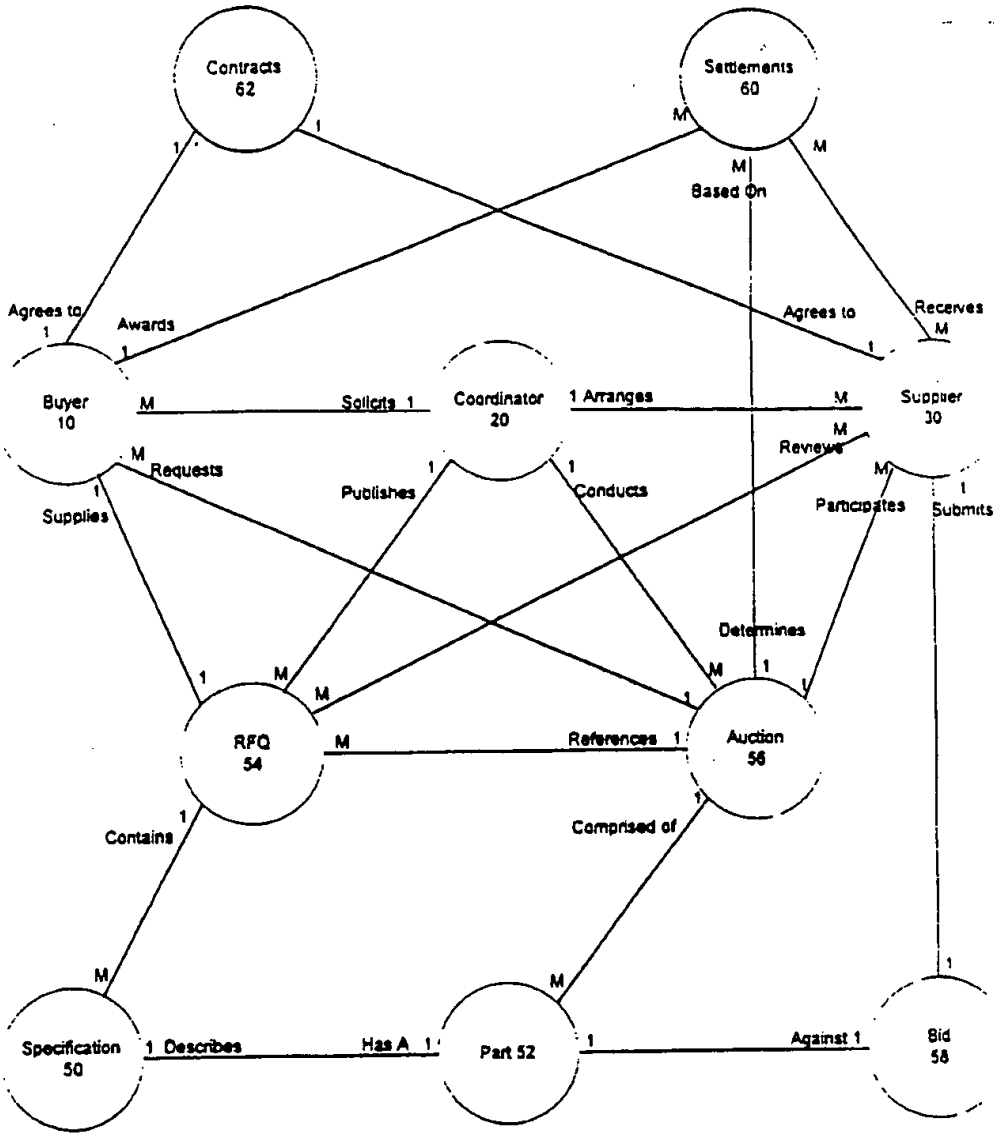

Contracts
62
Settlements
60
Based On
Agrees to
Awards
Agrees to
Receives
Buyer
10
Solicits
Coordinator
20
Arranges
Supplier
30
Requests
Publishes
Conducts
Reviews
Participates
Submits
Supplies
Determines
RFQ
54
References
Auction
56
Contains
Comprised of
Specification
50
Describes
Has A
Part 52
Against
Bid
58

Fig. 1

Fig. 2 - System Flow

	Coordinator	Buyer	Supplier
Initial Contact 102	Contact buyer	Provide Data	
RFQ 104	Collect & Administer RFQ Data	Provide RFQ Data	
	Publish & Administer RFQ		Access RFQ
	Manage RFQ Response		Respond to RFQ
Auction Administration 106		Request Auction	
	Coordinate & Administer Auction Setup		
	Assist & Administer User Auction Prep		Prepare for Auction
Conduct Auction 108	Assist & Administer Auction	Observe	Bid
Administer Auction Results 110	Analyze & Administer ~~CBE~~ Auction Results	View Auction Results	View Auction Results
Contract Administration 112		Settlement	Settlement

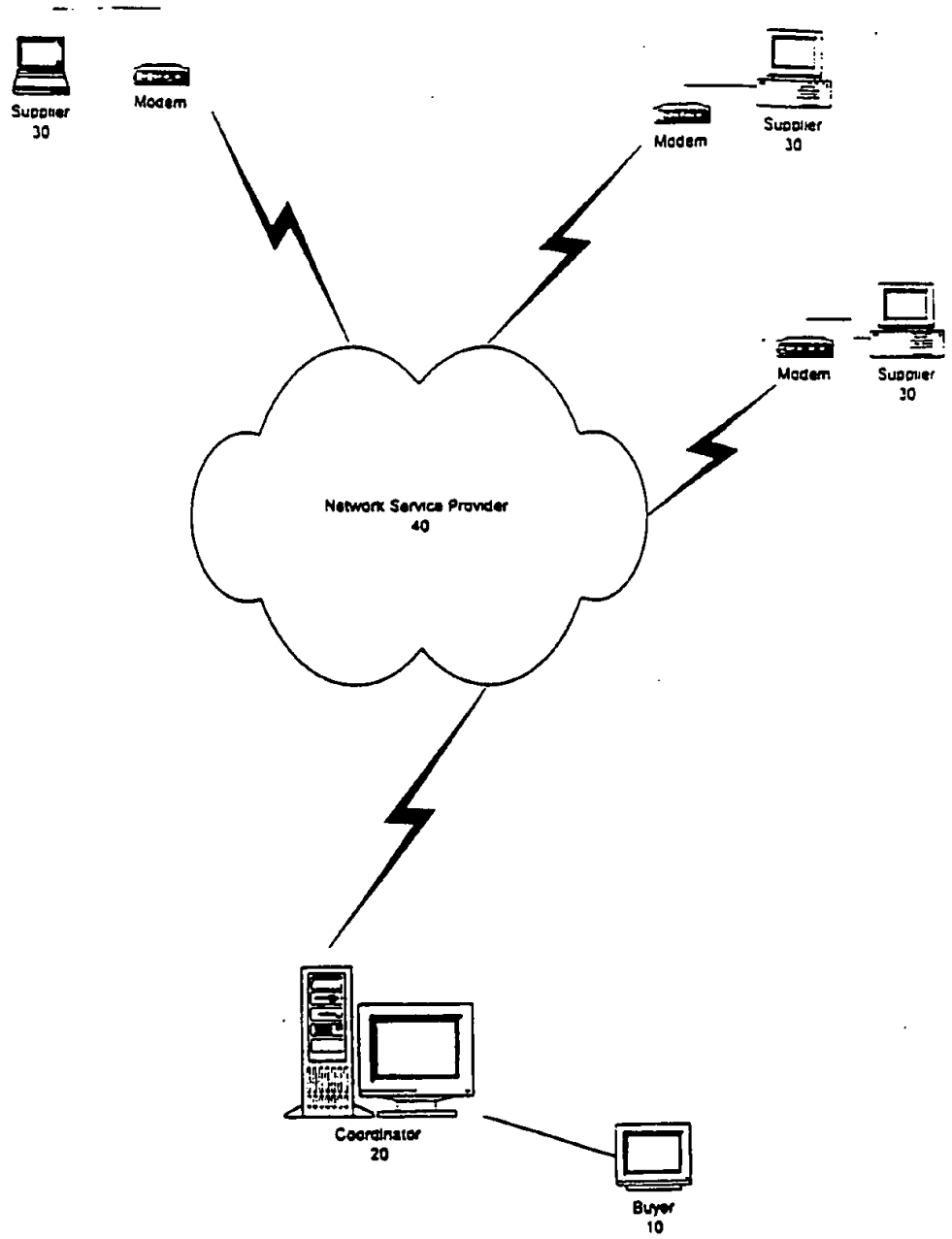

Supplier
30
Modem
Modem
Supplier
30
Modem
Supplier
30
Network Service Provider
40
Coordinator
20
Buyer
10

FIG. 3

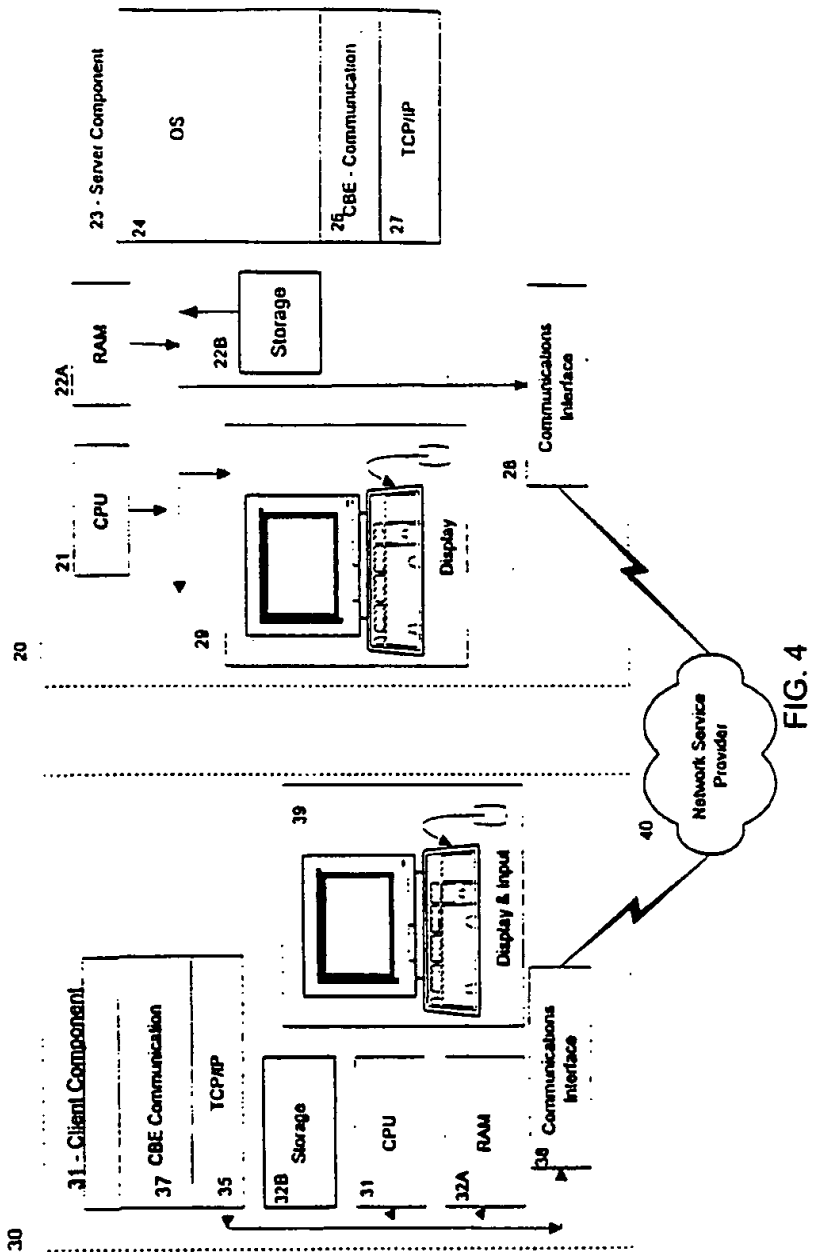
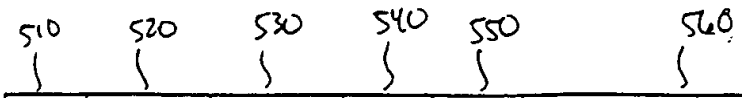

23 - Server Component
24
OS
26
CBE - Communication
27
TCP/IP
22A
RAM
22B
Storage
Communications Interface
28
21
CPU
29
Display
20
Network Service Provider
40
39
Display & Input
31 - Client Component
37
CBE Communication
35
TCP/IP
32B
Storage
31
CPU
32A
RAM
38
Communications Interface
30

FIG. 4



LI#	Part Num	Quantity /yr	Bid/ Unit	# of Yrs	Price Discount by Year of Contract		
					2	3	4
1	T1001	50,000	$10	4	5%	4%	3%
2	T1002	100,000	$3	4	5%	3%	--
3	T1003	250,000	$1	4	9%	--	--
4	T1004	7,500	$600	4	4%	2%	--
5	T1005	80,000	$8	4	--	--	--

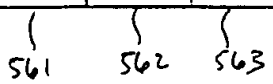


Figure 5

LI #	Part Num	Quantity /yr	Bid/ Unit	Year of Contract				NPV Bid
				1	2	3	4	
1	T1001	50,000	$10	$500,000	$475,000	$456,000	$442,320	$1,681,889
2	T1002	100,000	$3	$300,000	$285,000	$276,450	$276,450	$1,020,355
3	T1003	250,000	$1	$250,000	$227,500	$227,500	$227,500	$836,290
4	T1004	750	$600	$450,000	$432,000	$423,360	$423,360	$1,549,040
5	T1005	80,000	$8	$640,000	$640,000	$640,000	$640,000	$2,289,342
						Total NPV Bid		$7,376,916

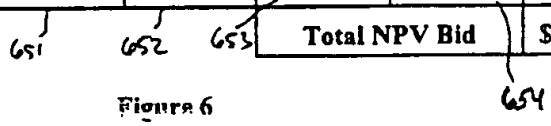


Figure 6

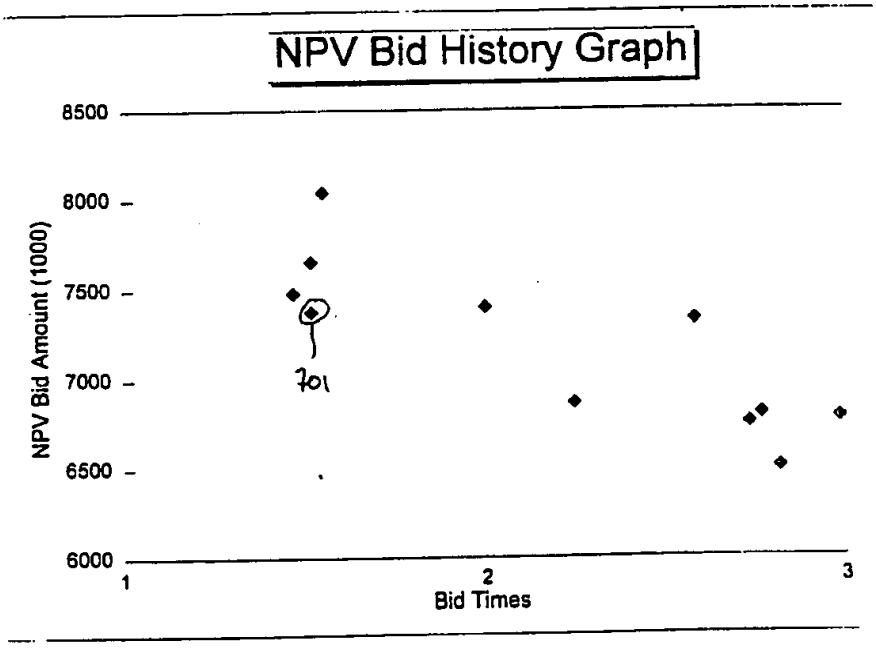

NPV Bid History Graph
8500
8000
7500
7000
6500
6000
NPV Bid Amount (1000)
701
1
2
3
Bid Times

Figure 7

BIDDER	BID TIME	NPV BID
ABC CORP.	1:33	$8,041,000
XYZ INC.	1:31	$7,657,630
SUPPLIERS INC.	1:36	$7,481,000
ABC CORP.	2:00	$7,400,000
SUPP CITY CORP.	**1:31**	**$7,376,916**
ABC CORP.	2:35	$7,327,000
XYZ INC.	2:15	$6,864,000
SUPP CITY CORP.	2:46	$6,800,000
SUPPLIERS INC.	2:59	$6,777,000
XYZ INC.	2:44	$6,747,000
SUPP CITY CORP.	2:49	$6,500,000

Figure 8